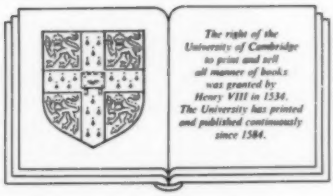
JOURNAL OF FLUID MECHANICS

VOLUME 203

JUNE 1989



CAMBRIDGE UNIVERSITY PRESS

Cambridge

New York Port Chester Melbourne Sydney

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

© Cambridge University Press 1989

Printed in Great Britain by the University Press, Cambridge

COPYING

The *Journal* is registered with the Copyright Clearance Center, 27 Congress St., Salem, Mass. 01970. Organizations in the USA which are also registered with C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per-copy fee of $5.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0022-1120/89/$5.00 + .00

ISI Tear Sheet Service, 3501 Market Street, Philadelphia, Pennsylvania 19104, USA is authorized to supply single copies of separate articles for private use only.

For all other use of material from the *Journal* permission should be sought from Cambridge or the American Branch of Cambridge University Press.

SUBSCRIPTIONS

The JOURNAL OF FLUID MECHANICS (ISSN 0022-1120) is published by the Cambridge University Press in 12 volumes each year. All orders must be accompanied by payment. Single volumes cost £38 net (US $75 in the USA and Canada) plus postage. The subscription price in the UK (which includes postage) to volumes 198–209, 1989, is £410, £450 elsewhere (US $880 in the USA and Canada) for institutions: £225 (US $450) for individuals. Copies of the journal for subscribers in the USA and Canada are sent by air to New York. Second class postage is paid at New York, NY, and at additional mailing offices. Claims for missing issues will be considered only if made immediately upon receipt of the subsequent issue. Copies of back numbers are available from Cambridge University Press. POSTMASTER: send address changes in USA and Canada to *Journal of Fluid Mechanics*, Cambridge University Press, 110 Midland Avenue, Port Chester, New York, NY 10573.

Volume 203 June 1989

CONTENTS

Blow-up of unsteady two-dimensional Euler and Navier–Stokes solutions having stagnation-point form. S. CHILDRESS, G. R. IERLEY, E. A. SPIEGEL and W. R. YOUNG *page* 1

The transition to baroclinic chaos on the β-plane. DANIEL R. OHLSEN and JOHN E. HART 23

The instability and acoustic wave modes of supersonic mixing layers inside a rectangular channel. CHRISTOPHER K. W. TAM and FANG Q. HU 51

An algebraic model for the turbulent flux of a passive scalar. MICHAEL M. ROGERS, NAGI N. MANSOUR and WILLIAM C. REYNOLDS 77

The relationship between surface-renewal and bursting motions in an open-channel flow. SATORU KOMORI, YASUHIRO MURAKAMI and HIRMASA UEDA 103

Flow in curved ducts: bifurcation structure for stationary ducts. P. DASKOPOULOS and A. M. LENHOFF 125

Surface-tension effects in the contact of liquid surfaces. HASAN N. OGUZ and ANDREA PROSPERETTI 149

Pulsatile flow through constricted tubes: an experimental investigation using photochromic tracer methods. MATADIAL OJHA, RICHARD S. C. COBBOLD, K. WAYNE JOHNSTON and RICHARD L. HUMMEL 173

The growth and collapse of cavitation bubbles near composite surfaces. A. SHIMA, Y. TOMITA, D. C. GIBSON and J. R. BLAKE 199

The propagation of two-dimensional and axisymmetric viscous gravity currents at a fluid interface. JOHN R. LISTER and ROSS C. KERR 215

One-dimensional adiabatic flow of equilibrium gas–particle mixtures in long vertical ducts with friction. GUIDO BURESTI and CLAUDIO CASAROSA 251

The interference of two passive scalars in a homogeneous isotropic turbulent field. H. KAPLAN and N. DINAR 273

The Dean equations extended to a helical pipe flow. M. GERMANO 289

Pressure fluctuations on an oscillating trailing edge. THOMAS STAUBLI and DONALD ROCKWELL 307

The generation and collapse of a foam layer at the roof of a basaltic magma chamber. CLAUDE JAUPART and SYLVIE VERGNIOLLE 347

The squeezing of red blood cells through capillaries with near-minimal diameters. D. HALPERN and T. W. SECOMB 381

Steady compressible flow in collapsible tubes: application to forced expiration. DAVID ELAD, ROGER D. KAMM and ASCHER H. SHAPIRO 401

Note on shape oscillations of bubbles. T. Brooke Benjamin 419

Organized motions in a fully developed turbulent axisymmetric jet. Jin Tso and Fazle Hussain 425

The stress tensor for simple shear flows of a granular material. Charles S. Campbell 449

Numerical analysis of gas–particle two-phase flows. R. Ishii, Y. Umeda and M. Yuhi 475

Inertial migration of a sphere in Poiseuille flow. Jeffrey A. Schonberg and E. J. Hinch 517

Stationary instability of the convective flow between differentially heated vertical planes. P. G. Daniels 525

Flow in a partially filled, rotating, tapered cylinder. R. J. Ribando, J. L. Palmer and J. E. Scott 541

Flow past short circular cylinders with two free ends. M. M. Zdravkovich, V. P. Brand, G. Mathew and A. Weston 557

Influence of density variations on the structure of low-speed turbulent flows: a report on Euromech 237. L. Fulachier, R. Borghi, F. Anselmet and P. Paranthoen 577

Reviews

The Physics of the Earth's Core: An Introduction, by Paul Melchior 595

Shorter notices 596

Index to Volume 203 600